

Scientific Inquiry

4-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

4-1.2 Use appropriate instruments and tools (including a compass, an anemometer, mirrors, and a prism) safely and accurately when conducting simple investigations

Taxonomy Level: 3.2-B Apply Conceptual Knowledge

Previous/Future knowledge: In previous grades, students used magnifiers and eyedroppers (K-1.2), rulers (1-1.2), thermometers, rain gauges, balances, and measuring cups (2-1.2), and beakers, meter tapes and sticks, forceps/tweezers, tuning forks, graduated cylinders, and graduated syringes (3-1.5) safely, accurately, and appropriately. In future grades, students will continue to use these tools, when appropriate, as well as use new tools when collecting scientific data. A complete list of tools can be found in Appendix A of the Academic Standards.

It is essential for students to know that every simple scientific investigation provides information. This information is called *data*. Data can be qualitative observations or quantitative observations, such as measurements (in metric units or English units when appropriate).

It is essential for students to know that different instruments or tools are needed to collect different kinds of data.

- A *compass* is a tool that is used to determine the cardinal directions of North, South, East, and West when using a wind vane to identify wind direction.
- An *anemometer* is a weather instrument used to determine wind speed.
 - An anemometer should be vertical and needs to be able to spin without obstruction.
 - An anemometer measures wind speed in miles per hour (mph).
- A *mirror* (plane/flat) is a tool that reflects light toward a given direction.
- A *prism* is a tool that breaks light into the colors of the spectrum.
 - To use a prism appropriately, the light has to enter the prism at the correct angle to the surface in order to separate the white light.

It is essential for students to use care when handling these tools when gathering data.

- A compass should not be placed near a magnet.
- Care should be taken not to break or scratch the mirror or prism.

It is also essential for students to use tools from previous grade levels that are appropriate to the content of this grade level such as magnifiers, rulers (measuring to millimeters), measuring cups (measuring in parts of a cup), rain gauges (measuring in inches), thermometers (measuring in °F and °C), beakers or graduated cylinders (measuring to milliliters or liters), forceps/tweezers, meter sticks and meter tapes (measuring in meters, centimeters, or millimeters) to gather data. Other units of measurement that students should be familiar with are kilograms (mass) or kilometers (distance).

NOTE TO TEACHER: See information in previous grades regarding how to use each tool. All temperature readings during investigations will be taken using the Celsius scale unless the data refers to weather when the Fahrenheit scale is used.

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It is not essential for students to use concave or convex mirrors, lenses, microscopes, barometers, or hygrometers. Tools from previous grades that are not appropriate to the content of this grade level are not essential; however, these terms may be used as distracters (incorrect answer options) for assessment, for example, eyedroppers, pan balances, graduated syringes, or tuning forks. Students do not need to convert measurements from English to metric or metric to English.

Assessment Guidelines:

The objective of this indicator is to *use* tools safely, accurately, and appropriately when gathering data; therefore, the primary focus of assessment should be to apply correct procedures to the use of a compass, an anemometer, mirrors, and a prism and other tools essential to the grade level that would be needed to conduct a science investigation. However, appropriate assessments should also require students to *identify* appropriate uses for a compass, an anemometer, mirrors, and a prism; *illustrate* the appropriate tool for an investigation using pictures, diagrams, or words; *exemplify* the correct tool for a specific task (add to all grade levels); *recall* how to accurately determine the measurement from the tool; or *recognize* ways to use science tools safely, accurately, and appropriately.